



Zika Virus Surveillance and Response Guidance

Vector-Borne Diseases Section
Division of Communicable and Environmental Diseases and
Emergency Preparedness
Tennessee Department of Health
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Statement of Problem

Zika virus (ZIKV) is an emerging infection spread by mosquito vectors and whose incidence and prevalence has exploded in the Americas in the past year. Preliminary investigations demonstrate vertical transmission of ZIKV to the fetus in pregnant women. These *in utero* infections have been associated with the potential for devastating outcomes including encephalopathy and microcephaly and spontaneous abortions. There is also an association with ZIKV infection and post-infectious Guillain-Barré syndrome (GBS) under investigation. Because of these epidemiological and clinical features, the World Health Organization declared ZIKV disease a Public Health Emergency of International Concern under the International Health Regulations 2005 on February 1, 2016. This present document is intended to provide guidance for local, regional and state health departments in the state of Tennessee.

Background

ZIKV, a flavivirus carried by *Aedes spp.* mosquitoes was discovered in the Zika Forest in the Virus Research Institute in Uganda in a non-human primate in 1947 and in *Aedes africanus* mosquitoes in 1948. Before 2007, there had been only 14 human ZIKV illness cases documented. In 2007, an outbreak in Micronesia on the Island of Yap was reported and was the first population-based epidemiological study published. It was estimated that 75% (attack rate) of the island's inhabitants were infected with ZIKV resulting in 18% symptomatic and 82% asymptomatic infections. The most common symptoms documented in this outbreak were maculopapular rash, fever, arthralgia, and conjunctivitis. From 2013 to 2014 there was a large outbreak in French Polynesia where *Aedes aegypti* was considered the most important vector.

In May 2015, the Pan American Health Organization issued an alert regarding the first confirmed ZIKV infection in Brazil. Since that time, local transmission has been reported in many other countries and territories in Latin America and the Caribbean. Brazil reported widespread ZIKV disease in adults and children, and a concomitant and significant rise in the number of infants reported with encephalopathy and microcephaly, as well as increases in miscarriages. Although not yet confirmed, there is increasing clinical and epidemiologic evidence to support ZIKV as a cause of significant congenital defects and fetal losses. Additionally, reports of increasing incidence of GBS have surfaced in countries experiencing ZIKV epidemics and this syndrome is now being linked to ZIKV. Lastly, sexual transmission of ZIKV has been documented. The extent to which sexual transmission is driving the current outbreak is not known.

Recommendations for Potentially Exposed People

Patient with clinical illness but ZIKV testing not yet performed

1. Obtain or confirm initial clinical and epidemiologic data and follow decision tree ([Decision Tree](#)) and the decision tree guidance ([Additional Guidance for Decision Tree](#))
 - a. Demographics (e.g., age, sex, place of residence)
 - b. Clinical symptoms (e.g., fever, rash, arthralgia, or conjunctivitis)
 - c. Date of illness onset
 - d. Travel history in 2 weeks prior to illness onset
 - e. Pregnant (if yes, gestational week at time of symptom onset)
2. Establish if the patient has a clinically compatible illness with one or more of the following: acute onset of fever, maculopapular rash, arthralgia, or conjunctivitis
3. Assess for possible travel-associated versus locally-acquired infection
4. Determine risk of patient being viremic in an area without ongoing ZIKV transmission
5. If risk of viremia, assess and mitigate risk of local transmission
6. Ensure laboratory testing is performed for Zika, chikungunya and dengue viruses

Patient with positive ZIKV test results

1. Perform standard case investigation to obtain or confirm clinical and epidemiologic data (See p. 11)
 - a. Demographics (age, sex, place of residence)
 - b. Clinical symptoms (e.g., fever, rash, arthralgia, or conjunctivitis)
 - c. Syndrome (e.g. febrile illness, neuroinvasive disease, and/or acute flaccid paralysis)
 - d. Date of illness onset
 - e. Hospitalization and outcome
 - f. Travel history and place of residence in 2 weeks prior to illness onset
 - g. Organ, tissue, or blood donor or recipient
 - h. Pregnant or breast feeding
2. If the patient is pregnant
 - a. Refer to “Update: Interim Guidelines for Health Care Providers Caring for Pregnant Women and Women of Reproductive Age During a ZIKV Outbreak— United States and U.S. Territories, 2016” (<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6505e2er.pdf>)
 - b. After delivery, test infant for evidence of ZIKV infection, See Scenario 4; refer to the “Update: Interim Guidelines for Health Care for Infants and Children with Possible Zika Virus Infections – United States, February 2016” (<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6507e1.pdf>)
2. If the patient is a recent organ, tissue (e.g., corneas, skin), or blood donor or recipient
 - a. Notify blood banks, organ procurement organizations, or tissue banks
 - b. Quarantine remaining co-component blood or tissues
 - c. Identify other possibly exposed patients
 - d. Notify TDH

3. Assess for travel-associated versus locally-acquired infection in areas without known ZIKV transmission
 - a. Recent travel: Determine the specific dates and location of travel in the 2 weeks prior to illness onset. If recent travel to area with no known local transmission, notify TDH
 - b. No recent travel: Determine if the local health department or healthcare provider is aware of other similar cases in the area or among contacts of the patient. If concern of local transmission in a new area, notify TDH.
4. Determine risk of patient being viremic in an area without ongoing ZIKV transmission
5. Determine Zika case classification (see p. 9)
 - a. Confirmed or probable case: Report case in NBS
 - b. Indeterminate: Decide if additional testing is needed
 - c. Not a case: Report in NBS

Asymptomatic pregnant woman with possible exposure to ZIKV

1. Obtain or confirm clinical and epidemiologic data and follow decision tree (Decision Tree) and the decision tree guidance (Additional Guidance for Decision Tree)
 - a. Demographics (age, sex, place of residence)
 - b. Travel history during pregnancy
 - c. Gestational age at time of travel or currently if a resident of an area with transmission
2. Refer to “Update: Interim Guidelines for Health Care Providers Caring for Pregnant Women and Women of Reproductive Age During a ZIKV Outbreak— United States and U.S. Territories, 2016” (<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6505e2er.pdf>).
3. Serologic testing for ZIKV can be offered to asymptomatic pregnant women who traveled to an area with ongoing ZIKV transmission; however, interpretation of results is complex.
 - a. Because of cross-reactivity among related flaviviruses (e.g, dengue, yellow fever, and West Nile viruses) a positive IgM result can be difficult to interpret.
 - b. Plaque-reduction neutralization testing (PRNT) can be performed to measure virus-specific neutralizing antibodies to ZIKV and other flaviviruses. The levels of neutralizing antibodies can then be compared between flaviviruses, but these tests might also be difficult to interpret in persons who were previously infected with or vaccinated against flaviviruses.
 - c. A negative IgM result obtained 2–12 weeks after travel would suggest that a recent infection did not occur and could obviate the need for serial ultrasounds. Based on experience with other flaviviruses, IgM antibodies will be expected to be present at least 2 weeks after virus exposure and persist for up to 12 weeks.
 - d. Information about the performance of serologic testing of asymptomatic persons is limited; a negative serologic test result obtained 2–12 weeks after travel cannot definitively rule out recent ZIKV infection.
4. A false positive IgM result is more likely among women residing in areas with ongoing ZIKV transmission than among travelers because of a higher likelihood of previous exposure to a related flavivirus.
 - a. Pregnant women who do not report clinical illness consistent with ZIKV disease can be offered IgM testing upon initiation of prenatal care; among women with negative IgM results, repeat testing can be considered in the mid-second trimester because of the ongoing risk for ZIKV exposure and infection throughout pregnancy.

- b. Pregnant women with negative ZIKV IgM testing should receive routine prenatal care, including an assessment of pregnancy dating and an ultrasound at 18–20 weeks of gestation to assess fetal anatomy.
- 5. If infant has signs of microcephaly or intracranial calcifications detected prenatally or at birth, see Scenario 4.

Infant with possible congenital ZIKV infection

1. Obtain or confirm clinical and epidemiologic data for infant and mother and follow decision tree (Decision Tree) and the decision tree guidance (Additional Guidance for Decision Tree)
 - a. Demographics (age, sex, place of residence)
 - b. Obtain history of travel and clinical illness during pregnancy for mother
2. Refer to the “Update: Interim Guidelines for Health Care for Infants and Children with Possible Zika Virus Infections – United States, February 2016” (<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6507e1.pdf>)
 - a. Test for a possible congenital ZIKV infection in 1) infants with microcephaly or intracranial calcifications born to women who traveled to or resided in an area with ZIKV transmission while pregnant, or 2) infants born to mothers with positive or inconclusive test results for ZIKV infection.
 - b. Perform additional clinical evaluation and follow-up as recommended
3. Notify TDH.

Asymptomatic men with possible exposure to ZIKV but no compatible clinical illness

1. Men who reside in or have traveled to an area of ongoing ZIKV transmission who have a pregnant partner should abstain from sexual activity or consistently and correctly use condoms during sex with their pregnant partner for the duration of the pregnancy.
2. Men who reside in or have traveled to an area of active ZIKV transmission who are concerned about sexual transmission of ZIKV might consider abstaining from sexual activity or using condoms consistently and correctly during sex. Couples considering this personal decision should take several factors into account. Most infections are asymptomatic, and when illness does occur, it is usually mild with symptoms lasting from several days to a week; severe disease requiring hospitalization is uncommon. The risk for acquiring vector-borne ZIKV in areas of active transmission depends on the duration and extent of exposure to infected mosquitoes and the steps taken to prevent mosquito bites (<http://www.cdc.gov/zika/prevention>). After infection, ZIKV might persist in semen when it is no longer detectable in blood.

Criteria for Case Identification

Report any illness or laboratory finding to public health authorities that meets any of the following criteria:

- Any person with a clinically compatible illness for ZIKV infection that includes one or more symptoms of acute fever (reported or measured), rash, arthralgia, or conjunctivitis; OR Guillain-Barré syndrome; AND potential ZIKV exposure:
 - Residence or travel to an area with ongoing ZIKV transmission within 2 weeks of symptom onset; or
 - Epidemiologic link to a person with laboratory evidence of recent ZIKV infection.
- Any person with laboratory evidence of recent ZIKV infection as indicated by:
 - Culture of ZIKV from blood, body fluid, or tissue
 - Demonstration of specific ZIKV antigen or nucleic acid in serum, cerebrospinal fluid (CSF), tissue, or other specimen (e.g., amniotic fluid, urine, semen, saliva)
 - ZIKV-specific immunoglobulin M (IgM) antibodies in CSF or serum
 - ZIKV neutralizing antibody titers > 4-fold higher than neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred
- An infant with microcephaly or intracranial calcifications or central nervous system abnormalities:
 - Whose mother lived in or traveled to an area with ongoing ZIKV transmission during the pregnancy; or
 - Maternal evidence of ZIKV or unspecified flavivirus infection during the pregnancy.
- A person whose healthcare record contains a diagnosis of a ZIKV infection
- A person whose death certificate lists ZIKV infection as a cause of death or a significant condition contributing to death.

Case Definition for Case Classification

Clinical Criteria

Mosquito-borne or sexually transmitted case

A person with one or more of the following:

- acute onset of fever (measured or reported)
- maculopapular rash
- arthralgia
- conjunctivitis
- complication of pregnancy or fetal loss in a mother with compatible illness and/or epidemiologic risk factors; or
 - in utero findings of microcephaly and/or intracranial calcifications with maternal risk factors
- Guillain-Barré syndrome not known to be associated with another diagnosed etiology.

Congenital case

- live birth with microcephaly or intracranial calcifications or central nervous system abnormalities

Laboratory Criteria

1. detection of ZIKV or ZIKV specific nucleic acids in specimens of serum, CSF, urine, saliva, amniotic fluid, placenta, umbilical cord, or fetal tissue, OR
2. detection of ZIKV antigen by immunohistochemical staining of maternal or fetal tissue; OR
3. detection of ZIKV specific IgM antibody in serum, CSF, or amniotic fluid; AND ZIKV neutralizing antibody titers ≥ 4 -fold higher than neutralizing antibody titers against dengue virus or other flaviviruses endemic to region of exposure.

Epidemiologic Linkage

- Travel to a country or region with known ZIKV transmission, OR
- Sexual contact with a laboratory confirmed case of ZIKV infection, OR
- Receipt of blood or blood products within 30 days of symptom onset; OR
- Organ transplant recipient within 30 days of symptom onset; OR
- Association in time and place with a confirmed or probable case.
- For congenital syndrome, a pregnancy with maternal epidemiologic linkage.

Case Classification

Zika Virus Disease

Clinical Criteria

A person with one or more of the following:

- acute onset of fever (measured or reported)
- maculopapular rash
- arthralgia
- conjunctivitis
- complication of pregnancy
 - fetal loss in a mother with compatible illness and/or epidemiologic risk factors; or
 - in utero findings of microcephaly and/or intracranial calcifications with maternal risk factors
- Guillain-Barré syndrome not known to be associated with another diagnosed etiology.

Probable case

Meets clinical criteria AND

- resides in or has recently traveled to an area with ongoing ZIKV transmission, OR
- has direct epidemiologic linkage to a person with laboratory evidence of recent ZIKV infection (e.g. sexual contact, in utero or perinatal transmission, blood transfusion, organ transplantation), OR
- association in time and place with a confirmed or probable case

AND meets the following laboratory criteria:

- positive ZIKV-specific IgM antibodies in serum or CSF; and
- negative dengue virus-specific IgM antibodies; AND
 - No neutralizing antibody testing performed; or
 - Less than four-fold difference in neutralizing antibody titers between ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred.

Confirmed case

Meets clinical criteria AND

Has laboratory evidence of recent ZIKV infection by:

- Detection of ZIKV by culture, viral antigen or viral RNA in serum, CSF, tissue, or other specimen (e.g. amniotic fluid, urine, semen, saliva); OR
- ZIKV IgM antibodies in serum or CSF **with** ZIKV neutralizing antibody titers 4-fold or greater than neutralizing antibody titers against dengue or other flaviviruses endemic to the region where exposure occurred.

Zika Virus Congenital Infection

Clinical Criteria

An infant with microcephaly or intracranial calcifications or other central nervous system abnormalities.

Probable Case

An infant meets the clinical criteria AND:

- Mother lived in or traveled to a country or area with ongoing ZIKV transmission during the pregnancy; OR
- Mother has laboratory evidence of ZIKV or unspecified flavivirus infection during pregnancy;

AND the infant meets the following laboratory criteria:

- ZIKV IgM antibodies detected in serum or CSF; and
- Tests negative for dengue or other endemic flavivirus-specific IgM antibodies; AND
 - No neutralizing antibody testing performed; or
 - Less than four-fold difference in neutralizing antibody titers between ZIKV and dengue or other flaviviruses endemic to the region where exposure occurred.

Confirmed Case

An infant meets the clinical criteria AND meets one of the following laboratory criteria:

- ZIKV detection by culture, antigen test, or polymerase chain reaction (PCR) in serum, CSF, amniotic fluid, urine, placenta, umbilical cord, or fetal tissue; OR
- ZIKV IgM antibodies present in serum or CSF with ZIKV neutralizing antibody titers 4-fold or greater than neutralizing antibodies against dengue or other flaviviruses endemic to the region where exposure occurred.



Zika Virus Disease Case Investigation Form



FOR CDC USE ONLY	
CDC R-number: _____	ZIKV ID: _____
CDC staff name: _____	CDC investigating group: _____
Reporting Jurisdiction	
Date form completed: ____/____/____	
Jurisdiction (state/territory): _____	Agency: _____
Contact Name: _____	Contact Phone: _____
Contact Position: _____	Contact Email: _____
Alternate Contact Name: _____	Alternate Contact Phone: _____
Demographic Information	
State of residence: _____	State case ID number: _____
Patient last name: _____	Patient first name: _____
Age: _____ <input type="checkbox"/> Years <input type="checkbox"/> Months <input type="checkbox"/> Days	Sex: <input type="checkbox"/> Male <input type="checkbox"/> Female
Travel History	
Travel start date: _____	Travel end date: _____
Country(s) visited: _____	
Vaccination History	
Previous vaccinations: <input type="checkbox"/> Yellow Fever <input type="checkbox"/> Japanese Encephalitis <input type="checkbox"/> Tick-borne Encephalitis	
Cases of Special Interest	
Pregnant	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Unknown
Microcephaly	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Suspect
Fetal loss	<input type="checkbox"/> Yes <input type="checkbox"/> No
Guillain-Barre syndrome/acute flaccid paralysis	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Suspect
Transmission Modes of Interest	
<input type="checkbox"/> Local vector-borne	<input type="checkbox"/> Organ/tissue transplant
<input type="checkbox"/> Sexual	<input type="checkbox"/> Breastfeeding
<input type="checkbox"/> Blood/blood product transfusion	
<input type="checkbox"/> Other suspected transmission mode: _____	
Clinical Information	
<input type="checkbox"/> Asymptomatic <input type="checkbox"/> Symptomatic (Illness onset date: ____/____/____)	
Fever	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes: <input type="checkbox"/> Subjective <input type="checkbox"/> Measured (Max measured temperature: _____)
Rash	<input type="checkbox"/> Yes <input type="checkbox"/> No If yes: Type: <input type="checkbox"/> Maculopapular <input type="checkbox"/> Petechial <input type="checkbox"/> Purpuric <input type="checkbox"/> Other Pruritic: <input type="checkbox"/> Yes <input type="checkbox"/> No Distribution: _____
Arthralgia	<input type="checkbox"/> Yes <input type="checkbox"/> No Myalgia <input type="checkbox"/> Yes <input type="checkbox"/> No Oral ulcers <input type="checkbox"/> Yes <input type="checkbox"/> No
Conjunctivitis	<input type="checkbox"/> Yes <input type="checkbox"/> No Vomiting <input type="checkbox"/> Yes <input type="checkbox"/> No Hematospermia (for males) <input type="checkbox"/> Yes <input type="checkbox"/> No
Headache	<input type="checkbox"/> Yes <input type="checkbox"/> No Diarrhea <input type="checkbox"/> Yes <input type="checkbox"/> No Peripheral edema <input type="checkbox"/> Yes <input type="checkbox"/> No
Hospitalized	<input type="checkbox"/> Yes <input type="checkbox"/> No Died <input type="checkbox"/> Yes <input type="checkbox"/> No



Zika Virus Disease Case Investigation Form



Specimen Information	
Specimen 1 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 2 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 3 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 4 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 5 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 6 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues
Specimen 7 collected: ____/____/____	Type: <input type="checkbox"/> Serum <input type="checkbox"/> CSF <input type="checkbox"/> Urine <input type="checkbox"/> Amniotic fluid <input type="checkbox"/> Saliva <input type="checkbox"/> Urine <input type="checkbox"/> Placenta <input type="checkbox"/> Other tissues

Laboratory Testing Protocols

If a suspect case of ZIKV infection is identified, the healthcare provider should send specimens approved by a regional health officer to the state lab for testing. If a specimen is not approved but the healthcare provider suspects chikungunya or dengue, they can obtain testing through a commercial lab.

Zika testing:

- Testing will need to go through the state laboratory and will need approval from Epidemiology or Regional Health Officers.
- PCR or ELISA IgM testing decision will be made by TDH upon receipt based on onset date and the date of sample draw. As of now, PCR is being performed on samples collected ≤ 7 days after symptom onset and ELISA IgM is being performed on samples collected ≥ 4 days after symptoms onset (so sample collected between 4 and 7 days are receiving both PCR and IgM testing). Asymptomatic pregnant patients are receiving IgM testing only.

Chikungunya testing:

- If the specimen is collected within 5 days of illness onset, BOTH ELISA IgM testing and PCR testing of serum should be conducted.
- If the specimen is collected more than 5 days after illness onset, ONLY ELISA IgM testing is recommended.
- To definitively rule out the diagnosis of chikungunya, convalescent-phase serum samples should be obtained from patients whose acute-phase samples test negative.

Dengue testing:

- If the specimen is collected within 5 days of illness onset, BOTH ELISA IgM and PCR testing of serum should be conducted.
- If the specimen is collected more than 5 days after illness onset, ONLY ELISA IgM testing is recommended.
- To definitively rule out the diagnosis of dengue, convalescent-phase serum samples may be obtained from patients whose acute-phase samples test negative.

Testing through TDH Lab may be available for groups, special investigations, or suspect cases with no international travel history. TDH should be contacted prior to submitting any specimens to TDH Lab.

Personal Protection Information

Mosquito-borne transmission

- The mosquitoes that carry ZIKV may feed outdoors or indoors so it is important to keep doors and windows closed and/or screens in good repair (no holes).
- Bed nets used at night will not help prevent Zika, chikungunya, or dengue as the mosquitoes carrying these diseases are daytime biters; use bed nets at night to help prevent malaria when traveling to malaria affected areas.
 - Infants and others sleeping or resting during the day should use bed nets to avoid infection from daytime biting mosquitoes.
- When you return from your trip, minimize your exposure to mosquitoes in the area to reduce the risk of local transmission of the disease.
 - When indoors, use air conditioning and/or ensure that there are no holes in screens on windows and doors.
 - When outdoors:
 - Wear light-weight long-sleeved shirts and pants.
 - Use mosquito repellent containing 20-30% DEET on exposed skin.
 - Wear permethrin-impregnated clothing or spray permethrin on your clothing.
 - When using any repellent please be sure to follow label instructions.
 - If a person experiences fever, joint pain, headache, muscle pain, joint swelling, conjunctivitis, or rash within 2 weeks of returning home, they should contact their healthcare provider and report their recent travel history.
- We do have competent vectors (mosquito species) for ZIKV in Tennessee, people should:
 - Wear repellent.
 - Dump out standing water at least once a week.
 - If water can't be dumped out, it should be treated with larvicides. Mosquito dunks or mosquito torpedoes can be bought at local stores. Apply according to product label.
 - Call local mosquito control (if any) or work with a licensed commercial pest control company to do mosquito control locally.
 - Store under cover or remove and dispose of debris, tires, containers, saucers under outdoor potted plants, toys, wading pools, and anything else that can hold water for at least a week.

Sexual transmission

- Recommendations for men and their pregnant partners
 - Men who reside in or have traveled to an area of active ZIKV transmission who have a pregnant partner should abstain from sexual activity or consistently and correctly use condoms during sex (i.e., vaginal intercourse, anal intercourse, or fellatio) for the duration of the pregnancy.
 - Pregnant women should discuss their male partner's potential exposures to mosquitoes and history of Zika-like illness (<http://www.cdc.gov/zika/symptoms>) with their health care

provider; providers can consult CDC's guidelines for evaluation and testing of pregnant women.

- Recommendations for men and their non-pregnant sex partners
 - Men who reside in or have traveled to an area of active ZIKV transmission who are concerned about sexual transmission of ZIKV might consider abstaining from sexual activity or using condoms consistently and correctly during sex. Couples considering this personal decision should take several factors into account. Most infections are asymptomatic, and when illness does occur, it is usually mild with symptoms lasting from several days to a week; severe disease requiring hospitalization is uncommon. The risk for acquiring vector-borne ZIKV in areas of active transmission depends on the duration and extent of exposure to infected mosquitoes and the steps taken to prevent mosquito bites (<http://www.cdc.gov/zika/prevention>). After infection, ZIKV might persist in semen when it is no longer detectable in blood.
 - ZIKV testing has been recommended to establish a diagnosis of infection in some groups, such as pregnant women. At present, ZIKV testing for the assessment of risk for sexual transmission is of uncertain value, because current understanding of the incidence and duration of shedding in the male genitourinary tract is limited to one case report in which ZIKV persisted longer than in blood. At this time, testing of men for the purpose of assessing risk for sexual transmission is not recommended. As we learn more about the incidence and duration of seminal shedding from infected men and the utility and availability of testing in this context, recommendations to prevent sexual transmission of ZIKV will be updated.

Vector Surveillance and Control

Here we present a seasonal response to ZIKV in Tennessee. Surveillance and control recommendations are adapted from: <http://www.cdc.gov/chikungunya/resources/vector-control.html>

Surveillance and control of *Aedes aegypti* and *Aedes albopictus* in Tennessee

The prevention or reduction of transmission of Zika, dengue, and chikungunya viruses is dependent on the control of mosquito vectors and limiting person-mosquito contact. Mosquito surveillance is a key component of any local integrated vector management program. The goal of mosquito-based surveillance is to quantify human risk by determining local vector presence and abundance. These recommendations should be conducted by urban areas in Tennessee as local resources allow. The principal functions of Zika, dengue, and chikungunya virus mosquito-based surveillance programs are to:

- Determine presence or absence of *Ae. aegypti* and *Ae. albopictus* in a geographic area, in particular in urban areas
- Identify what types of containers are producing the most mosquitoes for targeting vector control efforts
- Develop detailed maps to track larval sites if *Ae. aegypti* or *Ae. albopictus* are detected in an area
- Collect mosquito population data and identify geographic areas of high abundance (high-risk)
- Monitor the effectiveness of vector control efforts
- Collect data on mosquito infection rates during outbreaks to:
 - identify primary/secondary mosquito vectors
 - establish thresholds at which humans get infected

Vector Potential in Tennessee

Aedes aegypti and *Ae. albopictus* are considered the potential vectors of ZIKV in the U.S. In Tennessee, *Ae. albopictus* is ubiquitous in urban, suburban and rural areas since it takes advantage of natural and artificial water-holding containers to lay eggs. It is thought that *Ae. albopictus* displaced in the U.S. after 1985 when it first arrived. However, there is evidence that *Ae. aegypti* may be recolonizing these areas. No formal surveys of *Ae. aegypti* have been conducted in Tennessee or in other southeastern U.S. states. *Aedes aegypti* is primarily an urban mosquito that utilizes artificial water-holding containers to lay its eggs. Both of these mosquitoes have a short flight range (less than 200 meters), so egg production sites are likely to be close to where the adult mosquito is found.

Both *Ae. aegypti* and *Ae. albopictus* are vectors of ZIKV. Both are equally competent for ZIKV. Although *Ae. aegypti* is thought to be a better vector due to its host preference and biting behavior other *Aedes* mosquitoes have driven Zika infections worldwide. These include *Ae. albopictus*, *Ae. polynesiensis*, and *Ae. henslii*. Our immediate concern in Tennessee is *Ae. albopictus* due to its presence in every county in our state and its occurrence in high abundance. Our second concern is the potential occurrence and distribution of *Ae. aegypti*.

Beginning of mosquito season

- Conduct public education campaigns focusing on reducing or eliminating larval habitats for *Ae. aegypti* and *Ae. albopictus* vectors (see <http://www.cdc.gov/denque/resources/30Jan2012/albopictusfactsheet.pdf>).
- Develop and distribute mosquito education materials about *Ae. aegypti* and *Ae. albopictus* and personal protection measures (see <http://www.cdc.gov/denque/resources/30Jan2012/albopictusfactsheet.pdf>).
- Initiate *Ae. aegypti* and *Ae. albopictus* community-wide surveys to:
 - determine presence or absence
 - estimate relative abundance
 - determine distribution
 - develop detailed vector distribution maps
 - evaluate the efficacy of source reduction and larvicide treatment
- Maintain community source reduction efforts.
- Initiate adult sampling to identify or confirm areas of high adult mosquito abundance
- Initiate preventive adult control to reduce adult populations targeting areas of high mosquito abundance
- Concentrate control efforts around places with high mosquito density

Single or several suspected/confirmed imported cases during mosquito season

- Begin public mosquito containment education campaigns aimed at preventing or minimizing contact between vectors and suspected or confirmed human cases, especially during the first week of illness when an infected person is viremic and can infect mosquitoes, thereby possibly triggering a local outbreak
- Initiate community source reduction, adult mosquito, and case containment initiatives to minimize the spread of infected mosquitoes that may have resulted

Source reduction activities

- Maintain community source reduction and education efforts (larval and adult). Educate the public to continually dispose of water holding containers to eliminate larval habitats. Or, if funding allows, host a community volunteer/waste disposal program to help facilitate removal of larval habitats. Reducing larval habitats is the most effective way to reduce the number of mosquitoes in the community.
- Treat with long-lasting larvicide any water-holding containers that cannot be dumped, covered, discarded or otherwise modified. Eliminate larval habitats within 100-200 yards/meters around a case's home.
- Educate the public about reported cases of disease and urge them to use:
 - Insect repellents
 - Window and door screens to prevent mosquitoes from entering the house
 - Air conditioning

Adult mosquito control

- Treat the outdoors within 100–200 yards/meters around a case's home with adulticide
- Provide outdoor residual and spatial insecticide treatments; repeat as necessary to reduce vector abundance

- Initiate/maintain adult sampling to estimate adult mosquito abundance and evaluate effectiveness of insecticide treatments

Outbreak or clusters of suspected or confirmed autochthonous cases

- Divide the outbreak area into operational management areas where control measures can be effectively applied to all buildings and public areas within a few days; repeat as needed to reduce mosquito density
- Conduct door-to-door inspections and mosquito control in an area-wide fashion (reach >90% coverage of the control area within a week)
- Identify and treat, modify, or remove mosquito-producing containers
- Organize area/community clean-up campaigns targeting disposable containers (source reduction), including large junk objects that accumulate water (broken washing machines, refrigerators, toilets) in buildings, public areas, etc.
- Combine outdoor spatial or residual spraying with source reduction and larviciding (including residual spraying of container surfaces and adjacent mosquito resting areas). Don't forget to treat storm drains, roof gutters and other often overlooked cryptic water sources

Outreach to High-Risk Populations

Public education should be targeted at those traveling to areas where ZIKV is endemic and/or where outbreaks are currently occurring. Information should be disseminated using multiple means: department websites, newsletters, social media, and through engagement with traditional media.

ZIKV transmission is a risk to numerous populations including:

1. Travelers to countries with ongoing ZIKV transmission
 - a. Vacationers/Tourists - Information distribution outreach by travel agencies, airports, general news media
 - b. College students in field trips or study abroad programs - Information distribution outreach by colleges and universities, high schools, general news media, travel agencies
 - c. Mission groups - Information distribution outreach by religious Institutions and non-profits, general news media
 - d. Visitors of friends and family abroad - Information distribution outreach by bus terminals, airports, general news media
 - e. Migrants - Information distribution outreach by bus terminals, airports, general news media, and non-profits that work with refugee populations
2. Tennessee Residents if ZIKV transmission becomes autochthonous
 - a. Homeless - Information distribution outreach by churches and non-profit advocacy groups
 - b. Poor in urban areas - Information distribution outreach for each local health department to determine, but may include targeting outreach to groups via OB/GYN Offices (women of childbearing age), non-profits who work with low-SES populations, religious organizations, and community centers
 - c. General public - Information distribution outreach by local health departments, housing authorities, local elected officials

Appendices

A. Talking Points for the Public

Zika is a viral disease that is transmitted to people by *Aedes albopictus* and *Aedes aegypti* mosquitoes, between mother and child, or sexually. It has occurred in Africa, Southeast Asia, the Americas, and islands in the Pacific Oceans. In late May 2015, Zika was found for the first time in the Americas in Brazil and in December 2015 Puerto Rico reported its first locally acquired case. Though there has not been local transmission identified in Tennessee, there is a risk that the virus will be imported to new areas by infected travelers.

Callers may be interested in the stories linking ZIKV to birth defects. This is currently being investigated – more information may be found on the CDC website or at this link:

<http://www.cdc.gov/mmwr/volumes/65/wr/mm6503e2.htm>

For callers traveling to or returning from an area with active ZIKV transmission:

- The mosquitoes that carry ZIKV may also feed indoors so it is important to keep doors and windows closed and/or screens in good repair (no holes).
- Bed nets used at night will not help prevent Zika, chikungunya, or dengue as the mosquitoes carrying these diseases are daytime biters; use bed nets at night to help prevent malaria.
 - Infants and others sleeping or resting during the day should use bed nets to avoid infection from daytime biting mosquitoes.
- When you return from your trip, minimize your exposure to mosquitoes in the area to reduce the risk of local transmission of the disease.
 - When indoors, use air conditioning and/or ensure that there are no holes in screens on windows and doors.
 - When outdoors:
 - Wear light-weight long-sleeved shirts and pants.
 - Use mosquito repellent containing 20-30% DEET on exposed skin.
 - Wear permethrin-impregnated clothing or spray permethrin on your clothing.
 - When using any repellent please be sure to follow label instructions.
 - If a person experiences fever, joint pain, headache, muscle pain, joint swelling, conjunctivitis, or rash within 12 days of returning home, they should contact their healthcare provider and report their recent travel history.

For callers concerned about outbreaks of ZIKV in the U.S. and/or Tennessee:

- Reassure the caller that there have not been any cases of locally-transmitted ZIKV in Tennessee (local transmission means that mosquitoes in the area have been infected with the virus and are spreading it to people).
- Unless the caller has an old-world monkey for a pet, their companion animals cannot get chikungunya or Zika. Remind them not to use repellents designed for humans on pets, but to ask their veterinarian for products that can be used on animals.
- We do have competent vectors (mosquito species) for ZIKV in Tennessee, so remind people they need to:
 - Wear repellent.

- Dump out standing water at least once a week.
- If water can't be dumped out, it should be treated with larvicides. Mosquito dunks or mosquito torpedoes can be bought at local stores. Apply according to product label.
- Call local mosquito control (if any) or work with a licensed commercial pest control company to do mosquito control locally.
- Store under cover or remove and dispose of debris, tires, containers, saucers under outdoor potted plants, toys, wading pools, and anything else that can hold water for at least a week.

B. Talking Points for the Media

The disease:

ZIKV is primarily transmitted to people by mosquitoes. The most common symptoms of infection with ZIKV are fever, rash, conjunctivitis and joint pain.

Geographic distribution:

Zika outbreaks have occurred in countries in Africa, Southeast Asia, the Americas, and the Pacific Islands. In May 2015, ZIKV was found for the first time in Brazil followed by identification of transmission in Puerto Rico in December 2015. There is a risk that the virus will be imported to new areas, including Tennessee, by infected travelers if the mosquitoes that transmit the virus are present in the environment.

Current status in Tennessee:

The Tennessee Department of Public Health (TDH) is investigating reports of illnesses among travelers returning from areas where zika is present. Testing for individuals will be conducted on a case-by-case basis per Public Health recommendations in collaboration with health care providers. Please note that travel-associated cases (also called “imported” cases) identified in Tennessee means that **the disease was acquired in another country**. To date, there has not been a case of locally acquired ZIKV identified in Tennessee. However, because the species of mosquitoes (*Aedes* spp) that transmit ZIKV is found in Tennessee, there is a risk that virus imported into the U.S. by travelers will lead to local transmission. It is imperative that travel-associated cases are identified quickly and appropriate precautions to minimize exposure to mosquitoes are taken to reduce the risk of establishing local transmission. For current data on the number of travel-associated cases identified in Tennessee, please contact TDH Office of Communications.

Treatment/Prevention:

There is no vaccine to prevent or medicine to treat infection with ZIKV. Travelers can protect themselves by preventing mosquito bites. When traveling to countries with ZIKV, use insect repellent, wear long sleeves and pants treated with insect repellants, and stay in places with air conditioning or that have window and door screens in good repair (i.e., no holes). Travelers returning from areas where ZIKV is present and who develop fever and joint pain within 2 weeks after returning should see a doctor immediately.

Travelers who acquire the disease abroad and return home should take precautions to avoid mosquito bites for 10 days after developing symptoms to prevent infection of local mosquito populations and subsequent transmission of the virus to other people in the area. Travelers without symptoms should limit their exposure to mosquitoes for 21 days. These precautions include:

- When indoors, use air conditioning and ensure that there are no holes in screens on windows and doors.
- When outdoors, wear long-sleeved shirts and pants and use mosquito repellent with 20-30% DEET on exposed skin.

C. Release of Information to Media

During the investigation of a suspect case of Zika virus infection, TDH will not release any information pertaining to the patient. Only upon completion of the investigation will details be released to the media.

A complete investigation includes:

- All laboratory results have been received and no further testing is expected.
- The case has been interviewed by Regional or State Epidemiology.
- TPH has received the TDH Zika Case Report Form, confirmed the status of the case (i.e., confirmed or probable), and reported it to CDC via ArboNet, as well as through internal reporting systems (i.e., NBS).

Information that will be released to the media will be limited to the following:

- Region of the state
- Country of travel

For example, a statement that is released to a news outlet may say “TPH has recently confirmed Zika virus infection in a resident of Davidson County with recent travel to Brazil, where the individual was exposed to the virus.”

It is highly recommended that local and district health departments follow the same protocol when releasing information to the media.

D. Contact List

Dr. Abelardo Moncayo (Director, Vector-Borne Disease Program)

Email: Abelardo.Moncayo@tn.gov

Phone: 615-262-6356

Dr. John Dunn (Deputy State Epidemiologist)

Email: John.Dunn@tn.gov

Phone: 615-741-5948

Jim Gibson (Assistant Public Health Lab Director)

Email: Jim.Gibson@tn.gov

Phone: 615-262-6300

Woody McMillin (Director, Office of Communication & Media Relations)

Woody.McMillin@tn.gov

Phone: 615-741-3446

Local Health Department Contacts: <https://tn.gov/health/topic/localdepartments>

E. Resources

TDH specific documents

For general information on Zika virus, visit
<https://www.tn.gov/health/topic/zika-virus>

For specific information on Zika virus specific for Tennessee, visit
<https://apps.health.tn.gov/ReportableDiseases>

For Zika Virus Laboratory Testing **Decision Tree**, visit
<https://apps.health.tn.gov/ReportableDiseases/Disease/Zika/TDH%20Zika%20Decision%20Tree.pdf>

For Additional **Decision Tree Guidance**, visit
<https://apps.health.tn.gov/ReportableDiseases/Disease/Zika/Guidance%20for%20RHOs.pdf>

Guidance documents and MMWR articles

Recognizing, Managing, and Reporting Zika Virus Infections in Travelers Returning from Central America, South America, the Caribbean, and Mexico <http://emergency.cdc.gov/han/han00385.asp>

Zika Virus Spreads to New Areas — Region of the Americas, May 2015–January 2016
http://www.cdc.gov/mmwr/volumes/65/wr/mm6503e1er.htm?s_cid=mm6503e1er_e

Update: Interim Guidelines for Health Care Providers Caring for Pregnant Women and Women of Reproductive Age During a Zika Virus Outbreak— United States and U.S. Territories, 2016
(<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6505e2er.pdf>)

Update: Interim Guidelines for Health Care Providers Caring for Infants and Children with Possible Zika Virus Infections – United States, February 2016
(<http://www.cdc.gov/mmwr/volumes/65/wr/pdfs/mm6507e1.pdf>)

Interim Guidelines for Prevention of Sexual Transmission of Zika Virus — United States, 2016
(http://www.cdc.gov/mmwr/volumes/65/wr/mm6505e1.htm?s_cid=mm6505e1_e)

Recommendations for Donor Screening, Deferral, and Product Management to Reduce the Risk of Transfusion- Transmission of Zika Virus
<http://www.fda.gov/downloads/BiologicsBloodVaccines/GuidanceComplianceRegulatoryInformation/Guidances/Blood/UCM486360.pdf>

Notes from the Field: Evidence of Zika Virus Infection in Brain and Placental Tissues from Two Congenitally Infected Newborns and Two Fetal Losses — Brazil, 2015
(http://www.cdc.gov/mmwr/volumes/65/wr/mm6506e1er.htm?s_cid=mm6506e1er_w)

Local Transmission of Zika Virus — Puerto Rico, November 23, 2015–January 28, 2016
(http://www.cdc.gov/mmwr/volumes/65/wr/mm6506e2er.htm?s_cid=mm6506e2er_w)

Websites

Zika virus: <http://www.cdc.gov/zika/index.html>

Zika virus information for clinicians: <http://www.cdc.gov/zika/hc-providers/index.html>

Microcephaly: <http://www.cdc.gov/ncbddd/birthdefects/microcephaly.html>

Updated diagnostic testing for Zika, chikungunya, and dengue viruses in US Public Health Laboratories:
http://www.aphl.org/Materials/CDCMemo_Zika_Chik_Deng_Testing_011916.pdf#search=zika

Protection against mosquitoes: <http://wwwnc.cdc.gov/travel/yellowbook/2016/the-pre-travel-consultation/protection-against-mosquitoes-ticks-other-arthropods>

Zika-affected areas: <http://www.cdc.gov/zika/geo/index.html>

Travel notices related to Zika virus: <http://wwwnc.cdc.gov/travel/notices>

Information about Zika virus for travelers and travel health providers:
<http://wwwnc.cdc.gov/travel/yellowbook/2016/infectious-diseases-related-to-travel/zika>

Fact Sheets in Spanish:
<http://www.cdc.gov/zika/fs-posters/>